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ABSTRACT

This survey examined the level of interest and perceived computer competency of community-based clinical faculty (n=498) at the Michigan State University College of Human Medicine (MSU/CHM). Findings included: (1) 60 percent of respondents used computers for academic/scholarly purposes and 43 percent of nonusers indicated they didn't know how to use them; (2) institutional support (access to computers and question-answering) was perceived as lower by nonusers than users; (3) both computer users and nonusers were most interested in learning to use software related to e-mail and Internet access; and (4) 59 percent of users reported a lack of confidence regarding troubleshooting computer problems. Conclusions and recommendations include: teaching a core set of computer skills that offered hands-on learner practice preceded by either a tutorial or a demonstration; identification of local experts willing to serve as learner consultants; improved access to computers and peripherals; and identification of funding sources to support a statewide faculty development initiative. (Contains 11 references.) (DB)

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A Survey of Medical School Clinical Faculty to Determine Their Computer Use and Needs for Computer Skills Training

Christopher B. Reznich, Ph.D.

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College of Human Medicine
Michigan State University

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Executive Summary

Purpose

The overall purpose of the study was to determine the interest and perceived competence of MSU/CHM community-based faculty in the use of computer technology. The specific aims of the study were: 1) to assess perceived competence in using computers; 2) to assess needs/interests for computer training; 3) to determine faculty perceptions of computer support resources, and 4) to determine faculty confidence when using the computer.

Method

The study subjects were full, part time, and volunteer community campus faculty identified by the Community Administrators faculty who play significant roles in CHM undergraduate education. Application of these criteria yielded a subject pool of n=791. A written survey was mailed to all potential subjects, and 2 follow-up mailings.

Results

Three survey mailings yielded a return rate of 63% . According to the survey data:

1) 60% of key community campus faculty use computers for academic/scholarly purposes, and 40% faculty do not. Of the non-users, 43% indicated that they didn't know how.

2) there were significant differences between users and non-users with respect to computer access anytime desired (t=5.009, p=0.000), and finding someone to answer questions about computers (t=2.777, p=0.006), with non-users perceiving institutional support as lower in these areas than non-users.

3) the software most desired to learn among computer users was email/telecomm/Internet/WWW, for which 30% of computer users assigned their highest priority (1 - 3 out of 13). Presentation software received the second highest percentage of high rankings (20%), and third was computer assisted instruction (CAI), to which 18% of computer users assigned the highest rankings.

4) the software most desired to learn among non-users of computers was email/telecomm/Internet/WWW, which received the highest percentage of high ranks (34%); second was wordprocessing (24%); third was bibliographic database searching (22%) ; fourth was electronic textbooks (20%).

5) the operation with which computer users felt least confident was troubleshooting computer problems, with 59% of respondents choosing (1) or (2), "not very confident." Respondents also felt a lack of confidence with respect to using computers to analyze number data (57%), explaining why a program will/will not run on a given computer (53%), and learning advanced skills within a specific program (40%).

Conclusions and Recommendations

Several conclusions are suggested by the survey results:

- The data suggest several areas of computer skills that could comprise a core set of skills for learners. These include word processing or presentation graphics, bibliographic database searching, and telecommunications of various forms including using email and the world wide web.
- Given the frequency of certain tasks performed by computer users, a set of tasks including writing memos, preparing instructional materials, and searching the medical literature could serve as a core set of learner tasks which would transfer to the work setting.
- The data suggest clearly preferred learner strategies which can be incorporated into a faculty development program. Preferences include hands-on learner practice, preceded by either a tutorial or a demonstration. Such preferences should be taken into consideration when designing instruction for these learners.

The following recommendations are suggested:

- A possible next step in the process of preparing for faculty development may be to identify local experts willing to serve as learner consultants.
- Ready access to computers and peripherals (printers, models, network connections, etc.) are obvious prerequisites, and an assessment of needs in this area may need to be performed by the community corporations.

- One other very important next step is the identification of funding sources to support a state-wide faculty development initiative. Programs such "Information Access Grants" of the National Library of Medicine hold promise for supporting faculty development initiatives with respect to technology skills acquisition, especially in the areas of bibliographic database searching and library systems access.

This survey represents a first step in a process of skills-upgrading to prepare faculty role models for students of the College of Human Medicine. Some next steps have been suggested. Given recent pushes to extend the resources of the University's central campus to community faculty, including providing Pilot email accounts and devising means to allow Electronic Reference Library access, successful faculty development initiatives in this area are critical to ensure that such resources are used to their fullest potential.

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Introduction

The Need for Computer Competence Among Academic Physicians

The Subgroup Report on Medical Information Science Skills of the GPEP Report noted that "only a handful of American medical schools have the personnel and resources to provide education in the principles and operation of medical information systems." (p. 155) More recently, a lack of faculty members' experience with the technology of computers and with using computers to teach was a problem identified in the ACME-TRI report. At a national level, some authors have suggested the need to extend computer teaching into house staff education. (Robie, et.al., 1992) Several authors have reported on the variety of computer skills academic physicians can acquire to support their work. (Frisse, 1994; Faughnan, et.al., 1994) There is room for improvement of physicians' use of information technology. According to a recent article in the Wall Street Journal, although use of the Medline database has been found to help doctors in saving lives and curing ailments, and led to significantly lower costs and shorter hospital stays, only about 20% of practicing physicians are currently online. (Edupage, 1994) If medical students and residents are expected to acquire competence in the use of computers, then it is necessary to provide them with academic physician role models who use computers and faculty who can train them in basic computer skills as well as medical informatics.

General Statement of the Problem: Why Don't People Perform?

People choose not to perform a required task for a variety of reasons. Mager and Pipe (1970) note that lack of skill is but one reason underlying performance deficiencies. Other reasons include punishment for performance instead of reward, lack of consequences for performance, and obstacles to performance. In these latter instances, training will have no effect due to the fact that the real conditions causing nonperformance are not addressed. Rossett (1992) suggests four reasons for performance problems: 1) employees' lack knowledge or skill, 2) the environment is in the way, 3) there are no, few, or proper incentives, and 4) employees are unmotivated. Rossett further suggests that different causes of performance problems will necessitate different interventions. While a lack of skill or knowledge might require training, job aids, or coaching, lack of motivation may require informing workers of the benefits of performance, or promoting early success at a task.

Mager and Pipe, and Rossett remind us that not all performance problems can be solved by training alone. Awareness of the real causes of performance problems must inform any attempt at improving human performance.

Conditions That Promote Performance

Yelon (1992) describes four factors that promote or hinder transfer of learned skills to the workplace. "Transfer" is defined as "the application in the workplace of the knowledge, skills, and attitudes learned in training." (pg. 13) His "M.A.S.S." model of *motivation*, *awareness*, *skill*, and *support* is a theoretical framework describing conditions which promote transfer of learning

to the workplace. Yelon defines "motivation" as the desire to increase competence, aspiration to reach organizational goals, and confidence to reach those goals. "Awareness" is defined as mindfulness of the use of a newly acquired skill. "Skills" is defined as mastery of necessary subject matter. "Support", or the "culture of transfer", is a work climate in which fellow workers provide newly trained colleagues with psychological and physical support required to promote transfer. The M.A.S.S. model is a model for promoting transfer, i.e., planning instructional interventions, organizational climates, and performance technologies such that the possibility of transfer of newly learned skill and knowledge is increased.

The factors in the M.A.S.S. model of transfer of learning relate directly to the causes of performance problems suggested by Mager and Pipe and by Rossett. "Lack of skill" is one factor obviously underlying both performance deficiencies and inability to transfer new learning. "Punishment for performance instead of reward," "lack of consequences for performance," and "obstacles to performance," factors underlying performance deficiencies cited by Mager and Pipes, related directly to Yelon's "support" factor. "Skill" and "motivation" are factors cited by both Rossett and Yelon. Rossett's "environmental blocks or lack of proper incentives" relate directly to Yelon's "support" factor. It is clear that, while the M.A.S.S. model provides a useful framework for analyzing the potential for transfer of learning to the workplace setting, it's congruence with factors affecting performance in general suggest it's usefulness as a model for studying factors influencing performance or lack of performance in general.

Self-Efficacy

According to Bandura, self-efficacy is defined as an estimation of one's ability to perform target behaviors to produce outcomes. (Murphy, et.al., 1989) Individuals who judge themselves as capable to perform certain tasks or activities will tend to attempt and successfully execute them. One would hope that faculty who serve as role models for medical students in the "information age" would judge themselves as capable computer users.

Purpose of the Study

The purpose of the study was to determine to what extent MSU clinical campus faculty are in a position to meet their challenges as faculty role models competent in the use of computers. This survey attempted to describe the computer competence of MSU clinical campus faculty, particularly in support of their teaching, research, and scholarly activity; to assess their needs for computer training; to determine faculty perceptions of institutional support; and to determine faculty confidence when using the computer. The M.A.S.S. model served as the theoretical framework.

The objectives of the survey were:

1) to determine the extent to which MSU residency faculty and central campus clinical department faculty use computers to support their teaching, research, and scholarly activity.

2) to determine the needs for training in computer skills to support the teaching, research, and scholarly activity of MSU central campus clinical department faculty, and residency faculty. To determine preferred learning methods for computer skills development. To determine perceptions of institutional support.

3) to determine self-efficacy with respect to computer use: how confident do respondents feel when performing selected computer operations?

Methods

Prior Work

A draft survey instrument was devised based upon the research objectives and a review of the literature of computer training in medical education contexts. Haynes, et.al. (1991), reported on the use of survey research to assist with educational planning for health sciences faculty at McMaster University, and provided the investigator for this project with a copy of the instrument.

Murphy, et.al. (1989) reported their development of the Computer Self-Efficacy Scale (CES) as a measure of confidence in one's ability to perform a variety of computer skills. The 32-items of the instrument yielded three factors upon principle factor analysis: beginning level computer skills, advance level computer skills, and mainframe computer skills. A high score indicates a high degree of confidence in one's ability to use computers. In the interest of keeping the instrument as short as possible, the draft survey instrument used 23 of the

original scale's 32 items, deleting any items pertaining to mainframe operation (3 items), and 6 items felt to be redundant with other items.

Institutional review board approval was obtained prior to data collection.

Study Subjects

The subjects for the survey were full, part time, and volunteer clinical campus faculty identified by the Community Administrators as "key faculty" - those faculty which play significant roles in undergraduate clinical medical education, and who could be counted upon to remain with the program for at least a few more years. Application of these criteria yielded a subject pool of n=791. Community Administrators and Community Assistant Deans were included in the survey group.

Review and Pilot of the Survey Instrument

The survey instrument was reviewed and piloted prior to the survey. Reviewers were Dr. John O'Donnell and Dr. Willard Stawski of the Grand Rapids campus, Dr. Joseph Marshall of the Saginaw campus, and Dr. Michael Zaroukian of the Lansing campus. The survey was piloted by Dr. Gary Ferenchick, Dr. Henry Barry, and Dr. Jane Turner, of central campus who are faculty with the Primary Care Faculty Development Fellowship Program. The resulting survey was comprised of six sections:

I. General Information (7 items)

II. For Computer Users (4 items)

III. For Non-Users of Computers (1 item)

IV. Institutional Support (5 items)

V. Desire to Learn (3 items)

VI. Confidence in Abilities (23 items)

Self-identified computer users completed Section I, and were instructed to complete Sections II, IV, V, and VI. Non-users completed Section I and were instructed to complete Sections III, IV, and V.

Data Analysis

Data coding, entry, and verification was conducted by OMERAD Graduate Assistant Deborah Sleight. The data analysis was based upon the research objectives:

a) Descriptive statistics of demographics and computer use.

b) Ratings of perceptions of institutional support for computer users and non-users; Rankings of areas of need for computer training for computer users and non-users; rankings of preferred learning methods of computer users and non-users.

c) Self-evaluations of efficacy with respect to computer use - how comfortable do computer users feel when performing selected computer operations?

Limitations of the Study

By limiting the focus of computer use to academic purposes (teaching, research, and scholarly activity), it was beyond the purpose of the study to determine whether or not, and how, faculty used computers for business or strictly clinical purposes. It is recognized that lines between academic, clinical, and business uses of computer may blur, especially across the first two domains. A clinician may conduct a bibliographic database search to identify the most recent literature pertaining to a clinical problem, and this literature can also be used for teaching purposes, for example. Thus, while use of computers in support of the academic work of faculty is the primary focus of this research, it is recognized that such computer use can serve multiple purposes.

In identifying a selected sample of community faculty, we relied on the judgments of Community Administrators as to who should be included in the subject pool. Other than the criteria mentioned previously - "key faculty" defined as those faculty which play significant roles in undergraduate clinical medical education, and who could be counted upon to remain with the program for at least a few more years - it was left to the discretion of the Community Administrators to identify potential study participants.

Results

Section I: General Information

Three survey mailings yielded a return rate of 63% (502/791). Table One presents the Type of Academic Appointment, Academic Rank, and Academic Appointment of the respondents.

Table One: Type of Appointment, Academic Rank, Academic Appointment

Type of Appointment		Academic Rank		Academic Appointment	
regular	18% (89)	Instructor	16% (80)	full time	22% (109)
clinical	67% (336)	Assistant Professor	35% (171)	part time	12% (61)
adjunct	7% (35)	Associate Professor	30% (152)	volunteer	63% (317)
other	5% (24)	Professor	5% (27)	not indicated	3% (15)
didn't identify	3% (18)	Preceptor	3% (16)		
		other	6% (30)		
		didn't identify	5% (26)		

The majority of respondents, over 65%, held clinical appointments. Approximately a third of respondents (35%) held the rank of Assistant Professor, while another third (30%) held the rank of Associate Professor. The majority of respondents were volunteer faculty (63%).

Table Two presents age ranges for respondents. The most commonly reported age range was 36 - 45 years, the second-most commonly reported range was 46 - 55 years. Just over 70% of respondents ranged in age from 36 - 55 years.

Table Two: Respondent Ages

25-35	15% (74)
36-45	41% (204)
46-55	30% (152)
56-65	12% (60)
66-75	2% (8)
76 and over	<1% (2)
not indicated	<1% (2)

Table Three presents return rates for the clinical campuses. As has been noted previously, each Community Administrator suggested a list of "key people" to be included in the survey. The return rates for each community are reported first as a percentage of the whole subject pool (n=791), then as a percentage of the number of subjects identified by each Community Administrator for that community.

Table Three: Returns by Clinical Campus

community	overall (n=791)	within community
Flint	15% (74)	57% (74/129)
Grand Rapids	11% (54)	83% (54/65)
Kalamazoo	19% (93)	64% (93/146)
Lansing	28% (139)	61% (139/228)
Saginaw	17% (87)	66% (87/132)
Upper Peninsula	11% (55)	61% (55/90)

Of the CHM clinical communities, Grand Rapids had the highest return rate when measured as a percentage of possible respondents as identified by the Community Administrator (83%). It should be noted that three communities had return rates lower than the average return rate (63%) for all communities taken as a whole, and that these three communities accounted for approximately 57% of the total number of subjects, thus decreasing the overall return rate.

Section II: For Computer Users

Respondents were asked to indicate whether or not they used a computer for academic purposes. Table Four presents percentages of respondents who indicated whether or not they so used a computer. Sixty percent responded affirmatively.

Table Four: Computer Used for Academic Purposes

yes	60% (301)
no	40% (201)

A group identified as "computer users" were defined as the 60% of respondents who indicated that they used a computer for academic purposes. Over half (57%) of the users group indicated that they used a computer at least once a day (Table Five). A total of 84% of this "users' group" indicated that they used a computer more than once a week. This represents just about half of the total number of respondents, computer user and non-users combined.

Table Five: Average Computer Use
(n=301)

at least once/day	57% (171)
< daily, > once/week	27% (80)
weekly	6% (18)
< weekly, > once/month	6% (17)
monthly	2% (5)
< once/month	2% (5)
not indicated	2% (5)

Windows platforms were the most commonly reported computer used (75%), followed by Macintosh (20%) and DOS (19%). (Table Six)

Table Six: Type of Computer Used
(n=301)

Windows	75% (226)
Macintosh	20% (60)
DOS	19% (56)
OS/2	3% (9)
mainframe	5% (15)
other	4% (12)

The most commonly used software for academic purposes is word processing (89%), followed by email/telecommunications/Internet/WWW and bibliographic database searching (64% for both). (See Table Seven.) A minority of computer users used presentation software (39%) and information management (31%).

Table Seven: Software Used for Academic Purposes
(n=301)

word processing	89% (267)
email/telecomm/Internet/WWW	64% (194)
bibliographic database searching	64% (193)
presentation software	39% (118)
information management	31% (94)
spreadsheet	29% (88)
database	29% (87)
electronic textbooks	27% (80)
graphics	25% (76)
statistics	17% (51)
computer-assisted instruction	16% (49)
diagnostic/decision support	11% (34)
other	4% (13)

Table Eight presents scholarly or academic activities done with computers in descending order of reported frequency. The most common activities were "write letters/memos/journal articles" (77%) and searching the medical literature (71%), followed by preparing instructional materials (63%) and self-education (59%). Other activities performed by less than a majority of computer users included preparing scientific presentation (47%) and communicating electronically with colleagues (41%).

Table Eight: Scholarly or Academic Activities Done with Computers
(n=301)

write letters/memos/journal articles	77% (232)
search the medical literature	71% (213)
prepare instructional materials	63% (191)
self-education	59% (177)
prepare scientific presentations	47% (142)
communicate electronically with colleagues	41% (124)
perform statistical analyses	15% (46)
other	2% (7)

Section III: For Non-Users of Computers

Two-hundred and one respondents indicated that they did not use computers for academic purposes. Table Nine presents the reasons cited for not using computers in descending order of frequency. The most common reason cited was "don't know how" (43%), followed by "someone else is available to do it for me" and "no time to learn" (36% each). Twenty-four percent of non-users indicated that they don't know what computers can do for them, while 21% indicated that computers were unavailable to them at work.

Table Nine: Reasons for Not Using Computers
(n=201)

don't know how	43% (87)
someone else is available to do it for me	36% (73)
no time to learn	36% (72)
don't know what they can do for me	24% (49)
computers unavailable to me at work	21% (43)
no one to help me	17% (34)
don't need to use computers	16% (33)
other	11% (22)
afraid of/dislike technology	5% (11)
know how but afraid of/dislike technology	4% (9)

Section IV: Institutional Support

Tables Ten and Eleven present respondents perceptions of their institutions' support with respect to computer technology. Table Ten presents results for computer users while Table Eleven presents results for non-users.

Table Ten: Institutional Support, Computer Users
(n=301)

	no response	almost always	usually	rarely	almost never	don't know
At work, I have access to a computer anytime I desire.	2% (5)	56% (168)	25% (76	7% (21)	10% (29)	1% (2)
If I need a new piece of software, my organization will purchase it for me.	2% (7)	16% (48)	31% (92)	13% (38)	21% (63)	18% (53)
If I need a new piece of hardware, my organization will purchase it for me.	2% (7)	10% (30)	31% (94)	18% (54)	22% (65)	17% (51)
I can find someone to answer my questions about computers.	2% (7)	25% (76)	51% (153)	11% (34)	8% (24)	2% (7)
If I want to learn how to use a new piece of software, my organization will provide the means.	3% (9)	16% (48)	29% (87)	15% (46)	21% (62)	16% (49)

There were significant differences between users and non-users with respect to computer access anytime desired ($t=5.009$, $p=0.000$), and finding someone to answer questions about computers ($t=2.777$, $p=0.006$), with non-users perceiving institutional support as somewhat lower in these areas than non-users. There were no statistically significant differences between the two groups with respect to the three remaining items (purchasing software, purchasing hardware, providing means to learn a new piece of software).

Table Eleven: Institutional Support, Non-Users
(n=201)

	no response	almost always	usually	rarely	almost never	don't know
At work, I have access to a computer anytime I desire.	7% (14)	31% (63)	27% (54)	11% (23)	19% (39)	4% (8)
If I need a new piece of software, my organization will purchase it for me.	8% (16)	16% (32)	28% (57)	5% (11)	15% (31)	27% (54)
If I need a new piece of hardware, my organization will purchase it for me.	7% (15)	13% (27)	28% (57)	5% (10)	18% (37)	27% (55)
I can find someone to answer my questions about computers.	7% (14	19% (39)	34% (69)	16% (33)	13% (26)	10% (20)
If I want to learn how to use a new piece of software, my organization will provide the means.	8% (17)	12% (25)	23% (47)	11% (22)	16% (32)	29% (58)

Section V: Desire to Learn

Tables Twelve and Thirteen present respondents' rankings of computer software they desire to learn. Among computer users, the highest rated software was email/telecomm/Internet/WWW, for which 30% of computer users gave it their highest priority (1 to 3 out of a possible 13). Presentation software received the second highest percentage of high rankings; 20% of computer users ranked it 1 to 3. Third was computer assisted instruction (CAI), which 18% of computer users assigned the highest ranking.

Table Twelve: Desire to Learn, Computer Users
(n=301)

	rank					
	1st - 3rd	4th - 6th	7th - 9th	<9th	checked	not ranked/checked
word processing	11% (34)	6% (17)	2% (6)	1% (2)	7% (20)	74% (222)
email/telecomm Internet/WWW	30% (90)	6% (19)	2% (5)	0% (0)	11% (33	51% (154)
electronic textbooks	15% (44)	8% (25)	3% (10)	<1% (1)	6% (17	68% (206)
CAI	18% (54)	7% (22)	1% (4)	<1% (1)	5% (16)	68% (204)
bibliographic db searching	16% (47)	9% (26)	1% (4)	1% (2)	4% (12)	68% (206)
spreadsheet	12% (35)	5% (16)	1% (4)	1% (4)	4% (12)	76% (230)
statistics	14% (42)	8% (24)	1% (3)	<1% (1)	7% (21)	70% (210)
graphics	17% (51)	7% (21)	2% (6)	0% (0)	9% (27)	65% (196)
presentation software	20% (59)	13% (38)	1% (3)	0% (0)	10% (31)	56% (170)
database	10% (31)	8% (24)	1% (4)	1% (2)	5% (15)	75% (225)
information management	2% (7)	4% (13)	2% (6)	1% (3)	3% (8)	88% (264)
diagnosis/ decision support	15% (44)	9% (27)	1% (4)	1% (3)	9% (26)	65% (197)
other	2% (7)	0% (0)	0% (0)	0% (0)	2% (5)	96% (289)
none	0% (0)	0% (0)	0% (0)	0% (0)	3% (10)	97% (291)

Among non-users of computers, email/telecomm/Internet/WWW also received the highest percentage of high (1-3) ranks at 34%. Second was wordprocessing, which received 24% of high ranks among non-users. Bibliographic database searching was ranked 1-3 by 22% of computer non-

users, for third place, and electronic textbooks was fourth at 20% of non-users giving it their highest ranking.

Table Thirteen: Desire to Learn, Non-Users
(n=201)

	rank					
	1st - 3rd	4th - 6th	7th - 9th	<9th	checked	not ranked/checked
word processing	24% (48)	6% (13)	<1% (1)	0% (0)	20% (40)	49% (99)
email/telecomm Internet/WWW	34% (69)	2% (4)	1% (2)	0% (0)	21% (42)	42% (84)
electronic textbooks	20% (40)	7% (15)	0% (0)	0% (0)	11% (23)	61% (123)
CAI	6% (13)	10% (21)	2% (5)	0% (0)	11% (22)	70% (140)
bibliographic db searching	22% (45)	6% (13)	2% (4)	0% (0)	15% (30)	54% (109)
spreadsheet	4% (8)	2% (4)	1% (3)	2% (4)	3% (6)	88% (176)
statistics	3% (6)	3% (6)	2% (4)	1% (3)	5% (11)	85% (171)
graphics	5% (10)	6% (13)	2% (4)	1% (3)	5% (11)	80% (160)
presentation software	7% (14)	10% (21)	1% (3)	0% (0)	8% (16)	73% (147)
database	6% (12)	5% (11)	2% (4)	1% (3)	4% (9)	81% (162)
information management	3% (6)	5% (11)	3% (7)	1% (3)	6% (13)	80% (161)
diagnosis/ decision support	11% (23)	11% (22)	2% (4)	<1% (1)	15% (30)	60% (121)
other	1% (3)	0% (0)	0% (0)	0% (0)	1% (2)	98% (196)
none	0% (0)	0% (0)	0% (0)	0% (0)	9% (18)	91% (183)

Subjects were asked to indicate their desire to use computers for various scholarly or academic activities by rank ordering a list of possible scholarly/ academic activities that could be done on the computer from highest (1) to lowest (8), ranking as many items as desired. Tables Fourteen and Fifteen present ranks for computer users and non-users of their desires to use computers for scholarly or academic activities.

Table Fourteen: Desire to Use Computer for Scholarly/Academic Activities, Computer Users
(n=301)

	1st - 3rd	4th - 6th	7th - 9th	checked	not ranked/checked
write letters/memos/ journal articles	22% (67)	7% (22)	1% (3)	12% (35)	58% (174)
prepare scientific presentations	21% (64)	9% (26)	1% (2)	12% (36)	57% (173)
prepare instructional materials	25% (74)	8% (23)	0% (0)	12% (36)	56% (168)
perform statistical analyses	15% (44)	7% (20)	1% (3)	10% (29)	68% (205)
communicate electronically with colleagues	21% (64)	11% (34)	1% (3)	11% (32)	56% (168)
search the medical literature	30% (89)	10% (30)	0% (0)	16% (47)	45% (136)
self-education	19% (57)	13% (39)	2% (7)	16% (49)	50% (149)
other	1% (4)	<1% (1)	0% (0)	1% (3)	97% (293)
none	0% (0)	0% (0)	0% (0)	5% (16)	95% (285)

Thirty percent of computer users assigned the highest ranks (1-3) to searching the medical literature. Preparing instructional materials was given ranked highest by 25% of computer users, while writing letters/memo/journal

articles was given highest ranks by 22% of computer users. Other results are presented in Table Fourteen.

Table Fifteen: Desire to Use Computer for Scholarly/Academic Activities, Non-Users
(n=201)

	1st - 3rd	4th - 6th	7th - 9th	checked	not ranked/checked
write letters/memos/ journal articles	20% (41)	9% (19)	<1% (1)	16% (32)	54% (108)
prepare scientific presentations	12% (25)	6% (13)	0% (0)	13% (26)	68% (137)
prepare instructional materials	18% (36)	5% (10)	0% (0)	17% (34)	60% (121)
perform statistical analyses	5% (11)	4% (8)	3% (6)	5% (11)	82% (165)
communicate electronically with colleagues	16% (32)	7% (14)	0% (0)	12% (24)	65% (131)
search the medical literature	36% (73)	7% (14)	0% (0)	24% (48)	33% (66)
self-education	26% (53)	10% (20)	<1% (1)	24% (49)	39% (78)
other	0% (0)	0% (0)	0% (0)	0% (0)	100% (201)
none	<1% (1)	0% (0)	0% (0)	10% (21)	89% (179)

Among computer non-users, 36% assigned the highest ranks to searching the medical literature. Twenty-six percent assigned the highest ranks to self-education, while 20% assigned highest ranks to writing letters/memos/journal articles. The remaining results are presented in Table Fifteen.

Subjects were asked to assign ranks to their preferred methods of learning computer skills from 1-7, ranking as many as desired. Rankings were

collapsed into "high" (1, 2), "medium" (3, 4), and "low" (5 - 7) ranges to simplify data reporting. Tables Sixteen and Seventeen report these results for computer users and non-users.

Table Sixteen: Desired Learning Methods, Computer Users
(n=301)

	1st - 2nd	3rd - 4th	5th - 7th	checked	not ranked/checked
demonstration	4% (13)	8% (23)	3% (10)	4% (11)	81% (244)
demonstration/ hands-on practice	41% (122)	7% (22)	0% (0)	13% (38)	40% (119)
tutorial/ hands-on practice	44% (132)	5% (15)	1% (2)	11% (34)	39% (118)
practice/tutor available	15% (45)	20% (61)	2% (5)	4% (13)	60% (180)
videotape tutorial	8% (23)	13% (40)	4% (13)	7% (20)	68% (205)
printed materials	6% (17)	12% (36)	7% (22)	3% (9)	72% (217)
other	1% (4)	<1% (1)	0% (0)	<1% (1)	98% (295)

It is interesting to note that both computer users and non-users assigned similar rank orders to the possible learning methods. The method assigned the highest percentages of high rankings (1,2) was the tutorial plus hands-on practice. Forty-four percent of computer users gave this method their highest rankings, while 35% of non-users gave it their highest rankings. The next most popular method was demonstration and hands-on practice: 41% of computer users ranked this method highly (1, 2), while 31% of non-users ranked it highly. It is interesting to note that these two methods were the only methods for which a majority of respondents either assigned a rank, or gave it a check.

The next most popular method for both groups was practice with a tutor available. Fifteen percent of computer users ranked the method high, while 12% of non-users ranked it high. The remaining rankings are presented in Tables Sixteen and Seventeen.

Table Seventeen: Desired Learning Methods, Non-Users
(n=201)

	1st - 2nd	3rd - 4th	5th - 7th	checked	not ranked/checked
demonstration	1% (2)	5% (10)	3% (7)	5% (11)	82% (164)
demonstration/ hands-on practice	31% (63)	5% (11)	1% (3)	25% (50)	37% (74)
tutorial/ hands-on practice	35% (70)	2% (4)	0% (0)	17% (35)	46% (92)
practice/tutor available	12% (25)	12% (25)	<1% (1)	9% (18)	66% (132)
videotape tutorial	7% (15)	12% (24)	3% (6)	9% (18)	69% (138)
printed materials	4% (9)	6% (12)	7% (14)	6% (13)	76% (152)
other	0% (0)	<1% (1)	0% (0)	<1% (1)	99% (199)

Section VI: Confidence in Abilities

Computer users were asked to indicate their self-confidence in performing 23 different computer operations or functions by ranking their confidence on a 5-point scale ranging from 1="not very confident" to 5="very confident". The results appear in Table Eighteen. When combining results for (4) and (5), the two highest possible choices, respondents indicated they felt most confident moving the cursor around the screen (91%), making selections

from the on-screen menu and using a printer to make printed copy of work (86% for both), and using a computer to write a letter or essay (82%).

Table Eighteen: Self-Confidence in Computer Skills of Computer Users
(n=301)

	not very confident		somewhat confident		very confident	*
	1	2	3	4	5	*
1. add/delete information from a data file	9% (28)	8% (24)	21% (63)	18% (55)	37% (112)	6% (19)
2. escape/exit from a computer program	2% (6)	2% (6)	12% (37)	22% (66)	57% (171)	5% (15)
3. copy individual computer file	7% (22)	10% (29)	18% (54)	15% (46)	45% (134)	5% (16)
4. copy a disk	8% (24)	11% (32)	16% (49)	16% (48)	44% (131)	6% (17)
5. make selections from on-screen menu	1% (2)	2% (5)	7% (20)	21% (63)	65% (196)	5% (15)
6. move cursor around monitor screen	<1% (1)	1% (3)	3% (8)	9% (27)	82% (248)	5% (14)
7. use printer to make printed copy of work	<1% (1)	1% (3)	8% (24)	18% (53)	68% (206)	5% (14)
8. use computer to write letter or essay	<1% (1)	4% (13)	8% (25)	16% (48)	66% (199)	5% (15)
9. proper care/handling of a floppy disk	4% (12)	6% (19)	9% (28)	19% (58)	56% (170)	5% (14)
10. enter/save data into a file	3% (9)	7% (22)	13% (38)	21% (63)	51% (154)	5% (15)
11. get rid of computer files no longer needed	7% (21)	15% (45)	12% (37)	16% (47)	45% (135)	5% (15)

* = nothing circled, or more than one choice circled.

Table Eighteen: Self-Confidence in Computer Skills of Computer Users (continued)
(n=301)

	not very confident		somewhat confident		very confident	*
	1	2	3	4	5	*
12. get software up and running	9% (26)	12% (37)	21% (64)	21% (62)	32% (97)	5% (15)
13. organize/manage files	10% (29)	20% (61)	20% (60)	19% (56)	26% (79)	5% (16)
14. explain why a program will/will not run on a given computer	30% (89)	23% (69)	19% (56)	12% (36)	12% (36)	5% (15)
15. troubleshooting computer problems	32% (96)	27% (80)	20% (61)	9% (26)	8% (24)	5% (14)
16. use computer to analyze number data	29% (86)	28% (84)	18% (55)	11% (33)	9% (27)	5% (16)
17. understand terms related to hardware	8% (25)	24% (72)	28% (84)	22% (65)	13% (40)	5% (15)
18. understand terms related to software	8% (24)	22% (67)	33% (99)	18% (55)	14% (41)	5% (15)
19. learn to use a variety of programs	7% (22)	20% (59)	33% (98)	20% (61)	15% (46)	5% (15)
20. get help for problems	9% (26)	21% (64)	29% (85)	23% (68)	14% (43)	5% (15)
21. learn advanced skills w/in specific program	14% (41)	26% (77)	27% (81)	17% (51)	12% (36)	5% (16)
22. use computer to organize information	10% (31)	21% (62)	27% (82)	21% (64)	15% (46)	5% (16)
23. describe function of hardware	5% (15)	16% (47)	18% (55)	27% (81)	30% (88)	5% (15)

* = nothing circled, or more than one choice circled.

At the other end of the scale, the operation with which respondents felt least confident was troubleshooting computer problems, with 59% of respondents choosing (1) or (2), "not very confident." Respondents also felt a lack of confidence with respect to using computers to analyze number data

(57%), explaining why a program will/will not run on a given computer (53%), and learning advance skills within a specific program (40%).

Discussion

The discussion of the survey results will address each of the survey objectives. The survey objectives were:

1) to determine the extent to which MSU residency faculty and central campus clinical department faculty use computers to support their teaching, research, and scholarly activity.

2) to determine the needs for training in computer skills to support the teaching, research, and scholarly activity of MSU central campus clinical department faculty, and residency faculty. To determine preferred learning methods for computer skills development. To determine perceptions of institutional support.

3) to determine self-efficacy with respect to computer use: how confident do respondents feel when performing selected computer operations?

Objective One: Computer Use to Support Teaching, Research, and Scholarly Activity

The results indicate that, while a majority of community faculty report using computers, a significant percentage, 40% of respondents, do not. Of this latter group, almost half report "don't know how" as the reason for not using

computers. This indicates a strong need for training. Of the next two most often cited reasons for not using computer - "someone else is available to do it for me" and "no time to learn" - the latter reason suggests the need for efficient training systems that are developed with consideration for the clinicians' busy and often unpredictable schedules. A lack of awareness about what computers could do for them was cited by 24% of non-users, another "trainable issue." It should be noted with concern that at least one-fifth of the non-user group reported "computers unavailable to me at work" as the reason for not using technology, shedding light on a serious issue of institutional support. Another institutional support issue, "no one to help me" - was cited by 17% of the non-users.

While some respondents indicated reasons of lack of institutional support for not using computers, the most often cited categories were related to trainable issues - a lack of know-how, time to learn, and awareness of what computers can do

Returning to the computer users group, while Windows and DOS accounted for the vast majority of platforms in use, Macintosh was still used by one-fifth of the group. This indicates a need to allow for cross-platform compatibility should networking among community faculty be a desired goal.

By far the most common software used was word processing, followed by telecommunications software (email/telecomm/Internet/WWW) and bibliographic database searching. This data in itself may suggest a "basic curriculum" of computer software in which non-users may wish to acquire skills. No other software group approached the levels attained by these three packages. The most common scholarly activities cited by users meshes with the software: writing letters/memos/journal articles was cited most often by users; searching the medical literature, preparing instructional materials, self-

education, preparing scientific presentations, and communicating electronically with colleagues were also cited frequently by users. Again, such data may lend direction for computer skills instructional efforts by suggesting a set of core tasks that learners should master and, once successful, will likely lead to interest and use of other software applications.

Objective Two: Needs for Training, Preferred Learning Methods, Perceptions of Institutional Support

Among both users and non-users, the highest ranked software they desired to learn was email/telecomm/Internet/WWW. The two groups differed in their ranking of the other selections. Of software accorded at least 20% of the highest possible ranks ("1" - "3" out of 13), users preferred presentation software, computer-assisted instruction, graphics, and bibliographic database searching, and non-users preferred word processing, bibliographic database searching, and electronic textbooks. While there is some overlap in these two sets of desired software (telecommunication, bibliographic database searching, CAI/electronic textbooks), there is also some diversion of interests, which may suggest the need for diversity of instructional programming to meet these different interests.

There was considerable convergence of need for training when approaching the issue from the perspective of what scholarly/academic activities could be accomplished using the computer. Both groups cited several of the same activities, but assigned different importance to individual activities. Both users and non users gave their highest ranks ("1" - "3" out of 8) to searching the medical literature. "Writing letters/memos/journal articles" was the third most popular among users and non-users. Users and non-users

diverged with respect to their second highest ranked choices, with users preferring preparing instructional materials and non-users preferring self-education. Users rated "preparing scientific presentations" and communicate electronically with colleagues" similarly, while non-users ranked "prepare instructional materials" fourth and "communicate electronically with colleagues" fifth.

It is apparent that among both users and non-users, the activities "searching the medical literature," "writing letters/memos/journal articles," "preparing instructional materials," and "communicating electronically with colleagues" are shared interests. "Self-education" for non-users and "preparing scientific presentations" for users represent divergent interests with respect to academic tasks performed using computers. These results, when combined with data indicating the most commonly performed tasks and software used, help to suggest possible curricular topics for computer skills instruction. Thus far, it is apparent that any computer skills training offered to community faculty as a whole must include two sets of core skills - telecommunication (tasks: searching the medical literature, communicating electronically with colleagues; software: bibliographic database searching; email/telecomm/ Internet/WWW), and written communication (tasks: writing letters/memos/journal articles, preparing instructional materials; software: wordprocessing for non-users, presentation graphics for users). The diversity of software supporting written tasks is in response to the divergent needs reported by users and non-users, with users reporting a need to learn presentation software which would support preparing instructional materials as well as scientific presentations (a users' preference), and non-users reporting a need to learn how to use word-processing, which is the most commonly used productivity tool.

There was consistency evident in ranked preferences for desired learning methods among users and non-users. "Tutorial plus hands-on practice" and "demonstration and hands-on practice" were the first and second most popular choices of both groups, with "practice/tutor available" was ranked third by both groups. The relatively low ranking assigned to the remaining methods ("demonstration," "videotape material," "printed materials") by both groups effectively rules them out as possible learning methods.

Objective Three: Self-Efficacy - How Confident do Respondents Feel?

It is not surprising that computer users feel relatively confident performing very basic computer operations such as moving the cursor around the screen, making selections from the on-screen menu, and using a printer to make a copy of work. Among the skills with which users felt least confident, some are complexes of skills such as "using computers to analyze number data" and others are trainable such as "learning advanced skills within a specific program." Other skills, while trainable, may be unreasonable for a busy clinician to master, e.g., "trouble-shooting computer problems" or "explain why a program will/will not run on a given computer."

Conclusions

According to the survey data, a majority of key community campus faculty use computers for academic/scholarly purposes. Nevertheless, significant numbers of these faculty do not, and require support of various kinds to promote computer skills acquisition and use of computers. The data suggest several areas of computer skills that could comprise a core set of skills

for learners. These include word processing or presentation graphics, bibliographic database searching, and telecommunications of various forms including using email and the world wide web. Given the frequency of certain tasks performed by computer users, a set of tasks including writing memos, preparing instructional materials, and searching the medical literature could serve as a core set of learner tasks which would transfer to the work setting.

The data suggest clearly preferred learner strategies which can be incorporated into a faculty development program. Both methods include hands-on learner practice, preceded by either a tutorial or a demonstration. Such preferences should be taken into consideration when designing instruction for these learners.

It is obvious that, in order to support computer skills acquisition, access to hardware/software and to technical expertise should be readily available to learners. A possible next step in the process of preparing for faculty development may be to identify local experts willing to serve as learner consultants. Ready access to computers and necessary peripherals (printers, models, network connections, etc.) are obvious prerequisites, and an assessment of needs in this area may need to be performed by the community corporations

This survey represents a first step in a process of skills-upgrading to prepare faculty role models for students of the College of Human Medicine. Some next steps, such as identification of local learner consultants and assessment of needs for hardware and software have been suggested. One other very important next step is the identification of funding sources to support a state-wide faculty development initiative. Programs such "Information Access Grants" of the National Library of Medicine hold promise for supporting faculty development initiatives with respect to technology skills

acquisition, especially in the areas of bibliographic database searching and library systems access. Given recent pushes to extend the resources of the University's central campus to community faculty, including providing Pilot email accounts and devising means to allow Electronic Reference Library access, successful funding initiatives in this area are critical to ensure that such resources are used to their fullest potential.

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